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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/623,757	07/21/2003	Jin Zhao	TI-35855	4854

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EXAMINER	
SMITH, FRANCIS P	

ART UNIT	PAPER NUMBER
1792	

NOTIFICATION DATE	DELIVERY MODE
06/12/2008	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No. 10/623,757	Applicant(s) ZHAO ET AL.	
	Examiner Francis P. Smith	Art Unit 1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 21 July 2003.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-6,13-18 and 20 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-6,13-18 and 20 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date 3/14/2008.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

1. Applicants' amendment dated March 14, 2008 is acknowledged. Amendment to claims 6, 18, and 20 is acknowledged. Claims 1-6, 13-18, and 20 are currently pending and examined on the merits.

Claim Rejections - 35 USC § 103

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

3. Claims 1-5 and 13-17 stand rejected under 35 U.S.C. 103(a) as being unpatentable over the "Study of the NF_3 plasma cleaning of reactors for amorphous silicon deposition", Bruno et al. in view of Yin et al. (US 6,379,575) and in further view of Xi et al. (US 5,926,743).

Regarding claims 1, 13, 16, and 17, Bruno teaches a method of using NF_3 plasmas for the cleaning of reactors for amorphous silicon deposition from silane. Bruno discloses depositing one or more layers outwardly from an inner surface of a reactor chamber of a chemical vapor deposition system (forming an accumulation layer) at a thickness of 4μm (establishing a specified thickness) (pg. 691, col.1, lines 14-17). Then, a plasma clean cycle is employed by introducing a NF_3 cleaning/etching gas (pg. 691, col. 1, lines 14-17). However, Bruno is silent in regard to repeating the processing steps and calculating/providing a notification of a pre-determined volume or the use of software.

Yin teaches a process for treating and conditioning an etching chamber whereby the substrate (e.g. semiconductor wafer) is transported into the etching chamber and the etching, transportation, and cleaning and conditioning steps are repeated (col. 3, lines 61-64).

Xi discloses a method for removing particles and residues that build up inside a substrate processing system during a substrate processing operation. A system controller controls all of the activities of CVD machine. The system controller executes system control software (claims 16 and 17), which is a computer program stored in a computer readable medium such as a memory (col. 5, lines 56-60). The controller contains a subroutine for process gas control, which controls process gas composition and flow rates (and thus, capable of calculating the volume of cleaning gas used and providing notification of a predetermined volume) (col. 8, lines 13-14). Subsequently, after completion of the substrate processing operation, the substrate is removed from the processing chamber and a determination is made by the controller as to whether a clean step should be performed, which is analogous to providing a notification and scheduling a chamber maintenance (col. 10, lines 29-33).

Therefore, it would be obvious to one skilled in the art at the time of the invention to adapt Bruno's cleaning method by incorporating Yin's process repetition until a predetermined volume is reached as regulated by Xi's system control software in order to maintain a clean reactor chamber with a minimal accumulation layer capable of coating semiconductor wafers with few impurities.

Regarding claims 2 and 3, Bruno teaches a method of using NF_3 plasmas for the cleaning of reactors. A substrate (e.g. semiconductor wafer) is loaded/received into a load lock chamber and one or more layers is deposited on the received wafer. After approximately 6-8 deposition runs, the thickness of the accumulation layer is calculated at an approximate thickness of 4μm (pg. 691, col.1, lines 4-17).

Regarding claims 4-5, Bruno does not disclose a software system capable of establishing/measuring/calculating the volume of cleaning gas for chamber maintenance purposes.

Xi discloses a method for removing particles and residues that build up inside a substrate processing system during a substrate processing operation. As per claims 4 5, and 17, a system controller controls all of the activities of CVD machine. The system controller executes system control software, which is a computer program stored in a computer readable medium such as a memory (col. 5, lines 56-60). The controller contains a subroutine for process gas control, which controls process gas composition and flow rates (col. 8, lines 13-14). Therefore, it would be obvious to one skilled in the art at the time of the invention to utilize Xi's system control software in Bruno to establish/measure/calculate the volume of the cleaning gas used during one or more plasma clean cycles in order to effectively regulate the said plasma clean cycles.

As per claims 14 and 15, Bruno further teaches a method of using NF_3 plasmas for the cleaning of reactors. A substrate (e.g. semiconductor wafer) is loaded/received into a load lock chamber and one or more layers is deposited on the received wafer. After approximately 6-8 deposition runs, the thickness of the accumulation layer is

calculated at an approximate thickness of 4μm (pg. 691, col.1, lines 4-17). However, Bruno does not teach the use of software.

Xi discloses a method for removing particles and residues that build up inside a substrate processing system during a substrate processing operation. A system controller controls all of the activities of CVD machine. The system controller executes system control software, which is a computer program stored in a computer readable medium such as a memory (col. 5, lines 56-60). Therefore, it would be obvious to one skilled in the art at the time of the invention to automate Bruno's cleaning method with Xi's software in order to achieve a controlled and efficient cleaning process.

4. Claims 6, 18, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over the "Study of the NF_3 plasma cleaning of reactors for amorphous silicon deposition", Bruno et al. in view of Yin et al. (US 6,379,575), Xi et al. (US 5,926,743), and further in view of Doering et al. (US 6,174,377B1).

Bruno does not explicitly teach utilizing software. Regarding claims 6 and 18, the system controller of Xi executes system control software, which is a computer program stored in a computer readable medium such as a memory (col. 5, lines 56-60). After the completion of the substrate processing operation, the substrate is removed from the chamber and a determination is made by the controller as to whether a clean step should be performed. The clean step is performed after every *n* substrates are processed (col. 10, lines 29-34). Therefore, it would be obvious to one skilled in the art at the time of the invention to utilize Xi's controller system in Bruno to schedule a

chamber maintenance after the plasma gas has reached a predetermined volume in order to maintain a clean reactor chamber having a minimal accumulation layer and capable of coating semiconductor wafers with fewer impurities. Bruno/Xi however, do not teach replacing a part of the reaction chamber.

Doering teaches a processing chamber for performing chemical vapor deposition. Specifically, Doering discloses that it is obvious to remove and replace chamber parts during planned downtime and routine maintenance/cleanings (col. 21, lines 46-56). Exchanging chamber parts is advantageous in order to adapt to new and different processing conditions (col. 22, lines 22-26). Therefore, it would be obvious to one skilled in the art at the time of the invention to incorporate Doering's chamber part replacement step in Bruno/Xi's method in order to adapt the chamber for new and different processing conditions.

As per claim 20, Bruno teaches a method of using NF_3 plasmas for the cleaning of reactors for amorphous silicon deposition from silane. Bruno discloses depositing one or more layers outwardly from an inner surface of a reactor chamber of a chemical vapor deposition system (forming an accumulation layer) at a thickness of 4μm (establishing a specified thickness) (pg. 691, col.1, lines 14-17). Then, a plasma clean cycle is employed by introducing a NF_3 cleaning/etching gas (pg. 691, col. 1, lines 14-17). However, Bruno is silent in regard to repeating the processing steps and calculating/providing a notification of a pre-determined volume or the use of software.

Yin teaches a process for treating and conditioning an etching chamber whereby the substrate (e.g. semiconductor wafer) is transported into the etching chamber and

the etching, transportation, and cleaning and conditioning steps are repeated (col. 3, lines 61-64).

Xi discloses a method for removing particles and residues that build up inside a substrate processing system during a substrate processing operation. A system controller controls all of the activities of CVD machine. The system controller executes system control software, which is a computer program stored in a computer readable medium such as a memory (col. 5, lines 56-60). The controller contains a subroutine for process gas control, which controls process gas composition and flow rates (and thus, is necessarily capable of calculating the volume of cleaning gas used and providing notification of a predetermined volume) (col. 8, lines 13-14). Subsequently, after completion of the substrate processing operation, the substrate is removed from the processing chamber and a determination is made by the controller as to whether a clean step should be performed, which is analogous to providing a notification and scheduling a chamber maintenance (col. 10, lines 29-33).

Therefore, it would be obvious to one skilled in the art at the time of the invention to adapt Bruno's cleaning method by incorporating Yin's process repetition until a predetermined volume is reached as regulated by Xi's system control software in order to maintain a clean reactor chamber with a minimal accumulation layer capable of coating semiconductor wafers with few impurities. Bruno/Yin/Xi, however, do not teach replacing a part of the reaction chamber.

Doering teaches a processing chamber for performing chemical vapor deposition. Specifically, Doering discloses that it is obvious to remove and replace

chamber parts during planned downtime and routine maintenance/cleanings (col. 21, lines 46-56). Exchanging chamber parts is advantageous in order to adapt to new and different processing conditions (col. 22, lines 22-26). Therefore, it would be obvious to one skilled in the art at the time of the invention to incorporate Doering's chamber part replacement step in Bruno/Yin/Xi's method in order to adapt the chamber for new and different processing conditions.

Response to Arguments

5. Applicant's arguments filed March 14, 2008 have been fully considered but they are not persuasive.

6. Applicant argues that Xi fails to teach or suggest calculating the volume of the cleaning gas used or providing a notification that the volume of the cleaning gas used during the one or more plasma clean cycles has reaches the predetermined volume. However, Xi teaches that the cleaning of the chamber is executed by the controller. A user enters a process set number and process chamber number into a process selector subroutine. The process conditions, such as flow rates, are provided to the user in the form of a receipt, and thus, is necessarily capable of calculating the cleaning gas used. Furthermore, the sequencer subroutine can be designed to take into consideration the present condition of the process chamber (col. 7, lines 21-29). The process gas subroutine has a program code for controlling the process gas composition and flow rates. Typically, the process gas control subroutine operates by opening the gas supply lines, and repeatedly reading the necessary mass flow controllers, comparing the

readings to the desired flow rates received from the chamber manager subroutine, and adjusting the flow rates of the gas supply lines as necessary. Furthermore, the process gas control subroutine includes steps for monitoring the gas flow rates for unsafe conditions and may activate the safety shut off valves when unsafe conditions are detected (e.g. providing a notification once the flow rate/volume has reached a predetermined volume) (col. 8, lines 13-31). Therefore, Xi's process gas control subroutine can inherently calculate the volume of cleaning gas used.

The rejection of claims 6, 18 and 20 is based on new grounds of rejection necessitated by applicants' amendment.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Francis P. Smith whose telephone number is (571) 270-3717. The examiner can normally be reached on Monday through Thursday 7:00 AM-5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mikhail Kornakov can be reached on (571) 272-1303. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

FPS
/Michael Kornakov/
Supervisory Patent Examiner, Art Unit 1792